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Wilson et al.

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[54] **LIQUID FABRIC SOFTENER DISPENSER FOR AUTOMATIC WASHING MACHINES**

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[51] **Int. Cl.**[6] **D06F 39/02**

[52] **U.S. Cl.** ..... **8/158**; 68/17 A

[58] **Field of Search** ..... 8/158; 68/17 A; 222/553; 220/366.1; 494/63

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Primary Examiner—Philip R. Coe
Attorney, Agent, or Firm—Pearne, Gordon, McCoy & Granger

[57] **ABSTRACT**

A liquid fabric softener or treating liquid dispenser for a washing machine having a parabolic or egg-shaped body portion from which radially extends an annular rim portion. The rim portion rests upon a top surface of an agitator and is held in place thereon by a removable, resiliently press-fit cap. The rim portion has a series of bosses extending upwardly therefrom and a series of notched openings formed therein. The bosses space the cap member from the upper surface of the rim portion. During operation of the washing machine in a spin cycle, treating liquid within the body portion of the dispenser flows upwardly along an inner surface of the cup body, downwardly through the notched openings in the rim portion, and into a holding chamber provided within the hollow interior of the agitator. The holding chamber retains the treating liquid until the rotational speed of the agitator slows to a predetermined rate at an end of the spin cycle, and thereafter dispenses the treating liquid down the hollow interior of the agitator, through openings in a bushing and a bottom of a perforated inner wash tub, and into the outer wash tub wherein it is mixed with rinse water and subsequently delivered to the clothes within the inner wash tub in a diluted condition.

16 Claims, 4 Drawing Sheets

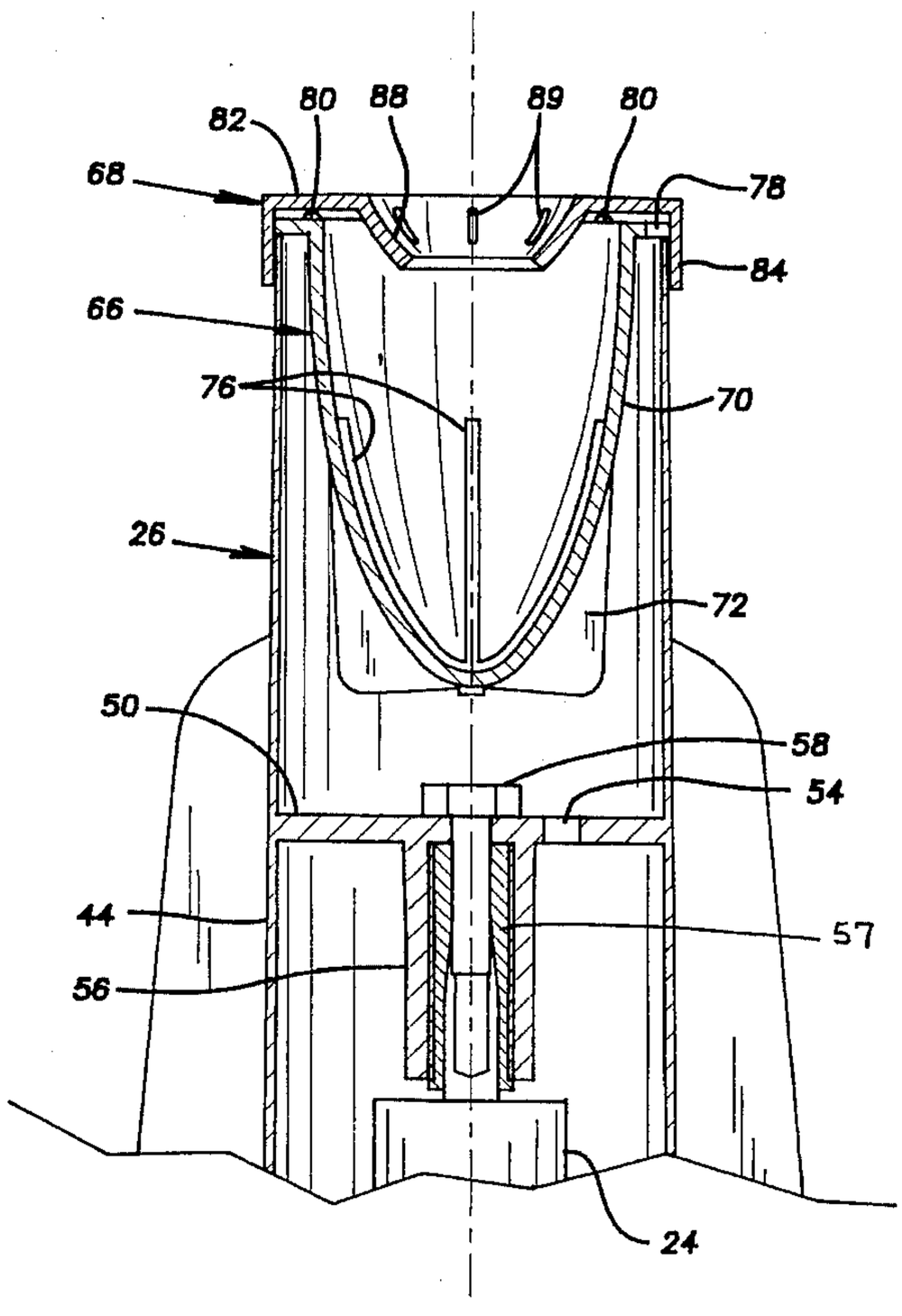
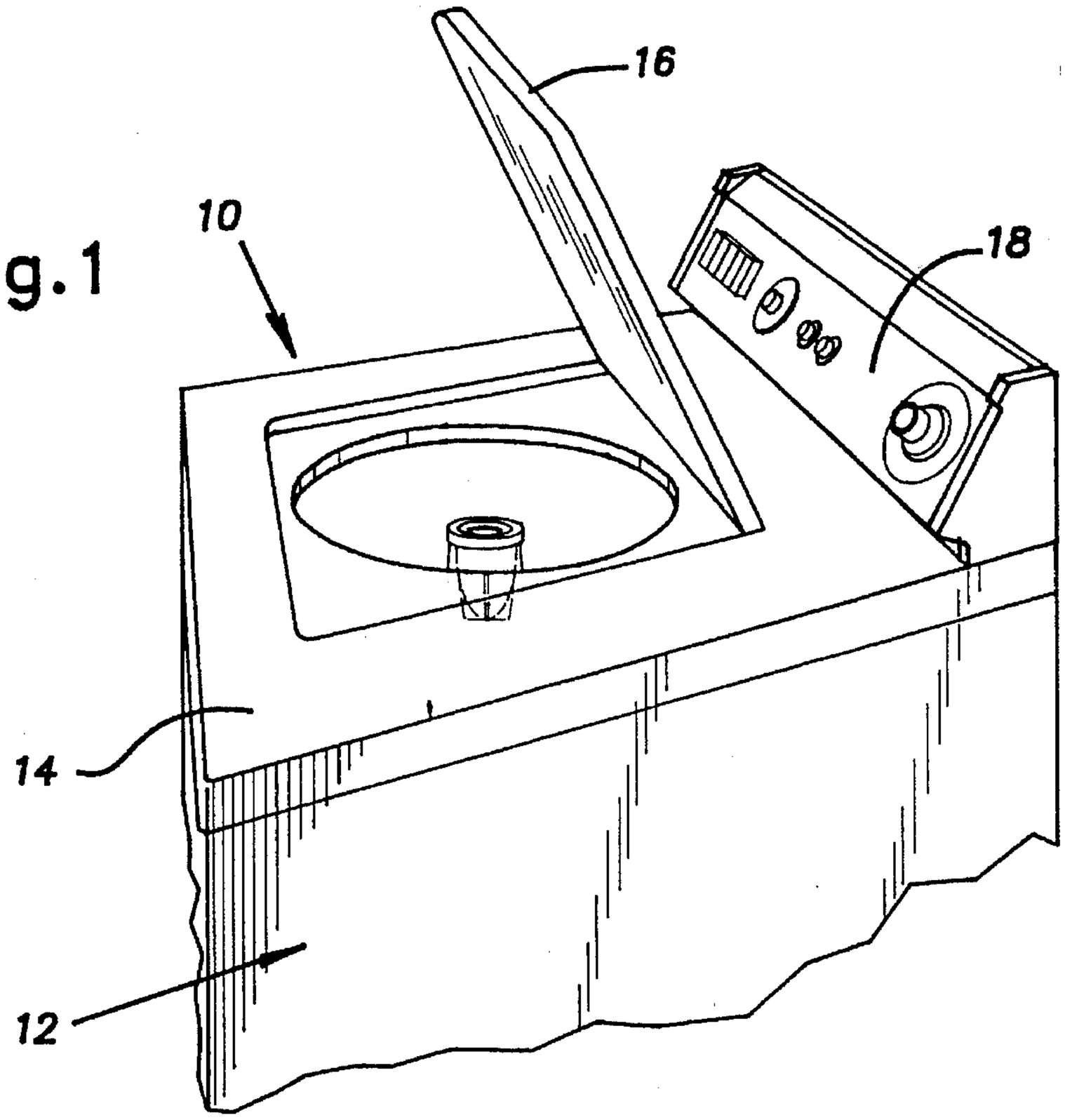


Fig.1



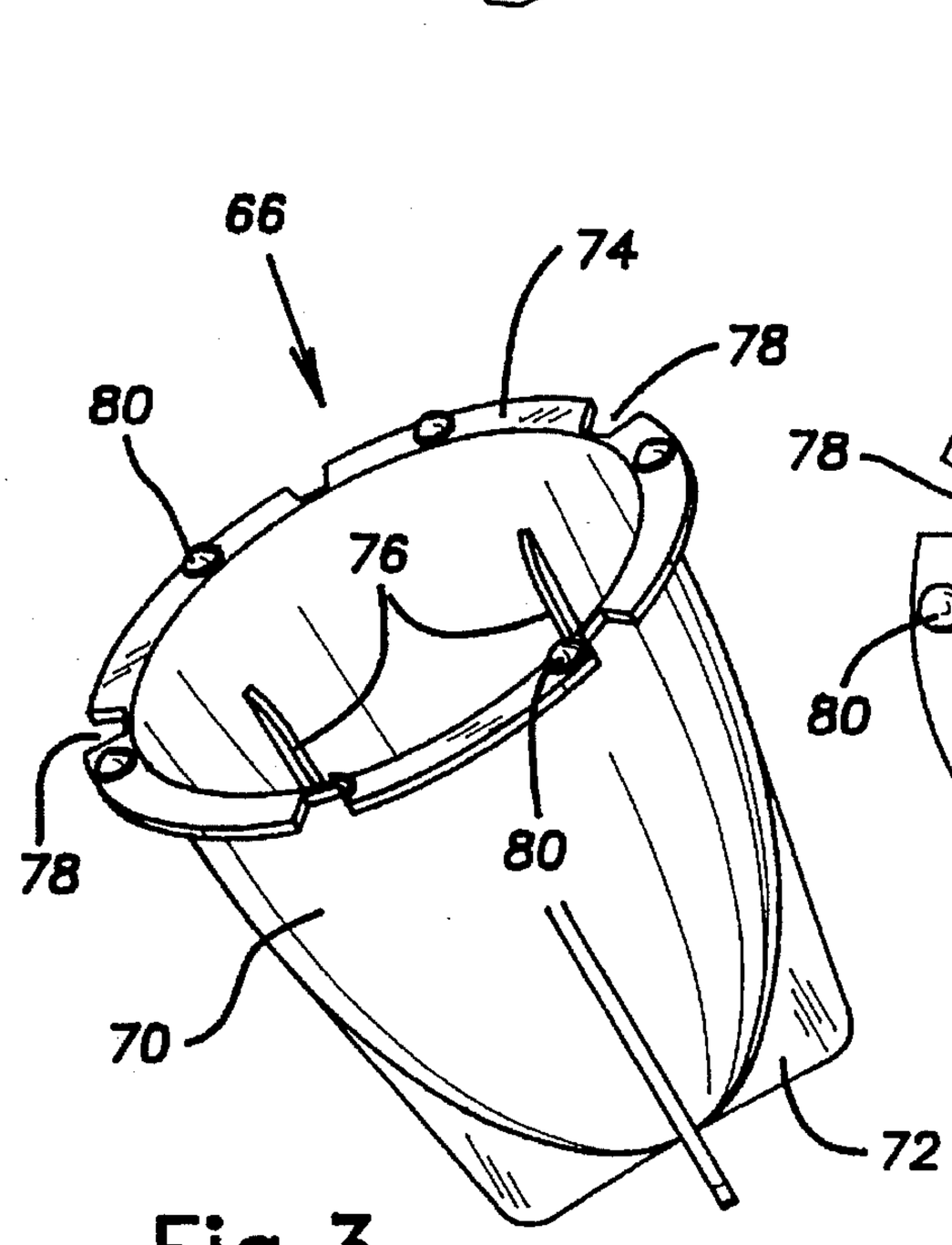


Fig.3

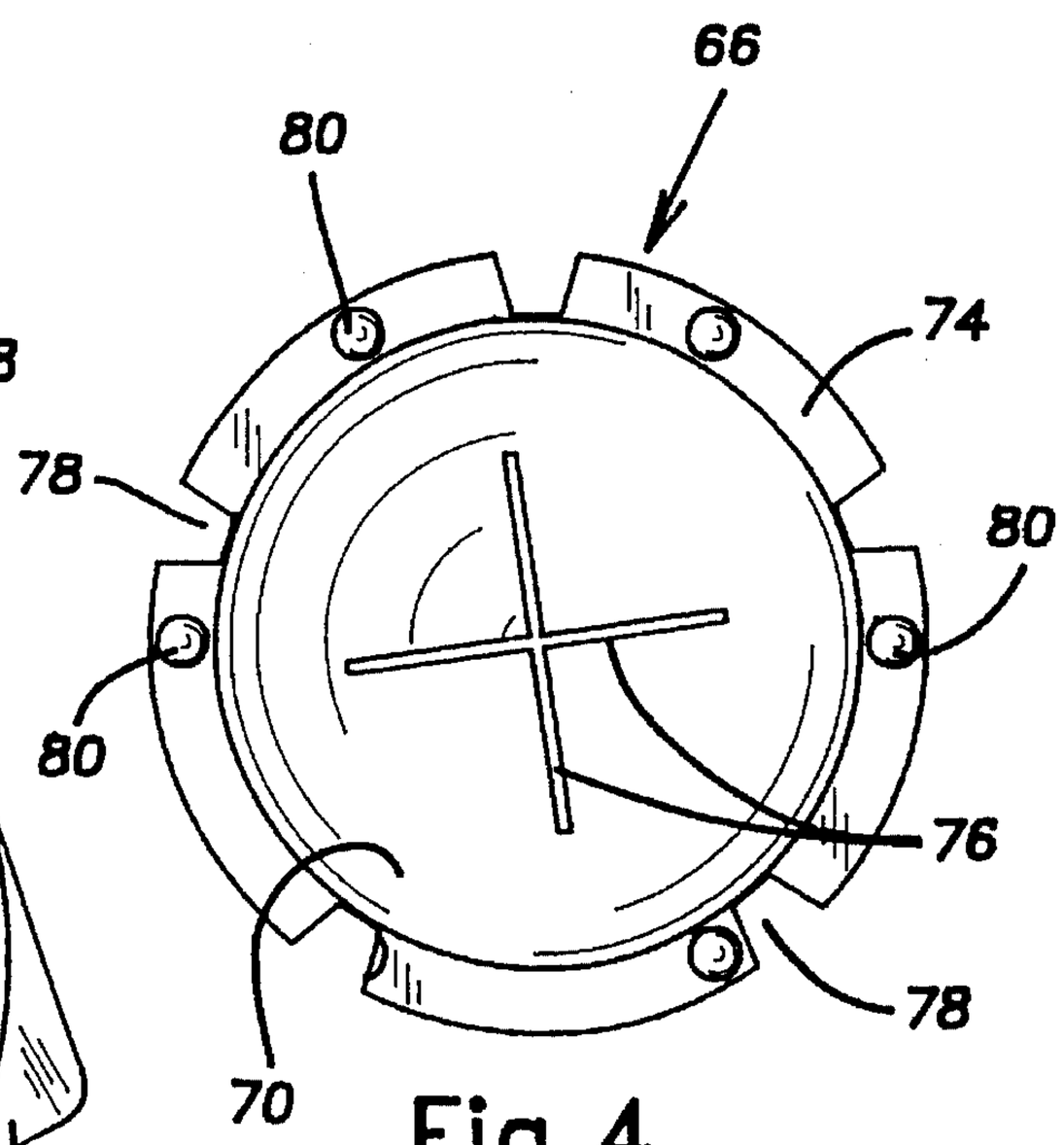


Fig.4

Fig.2

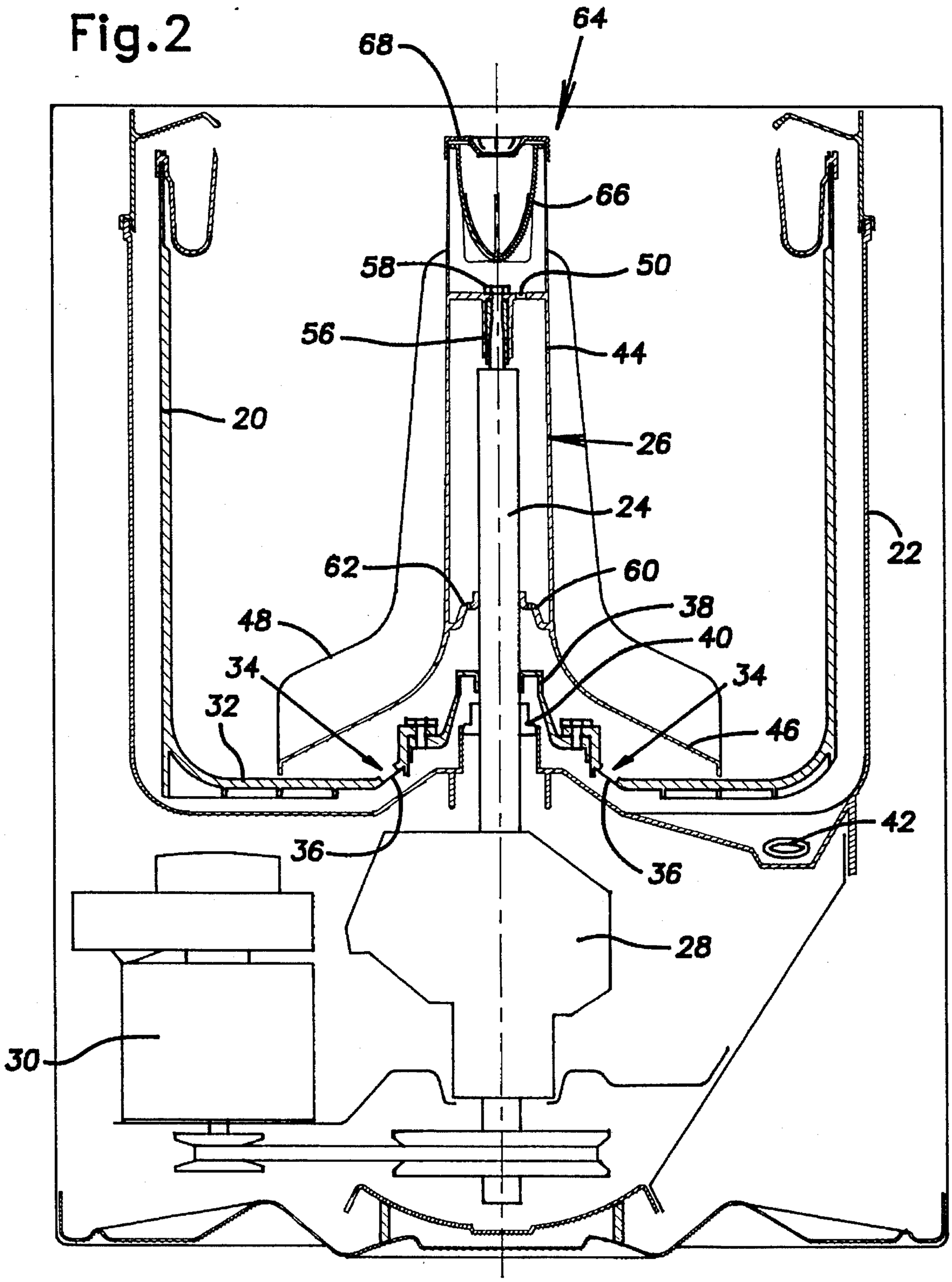

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Fig.5

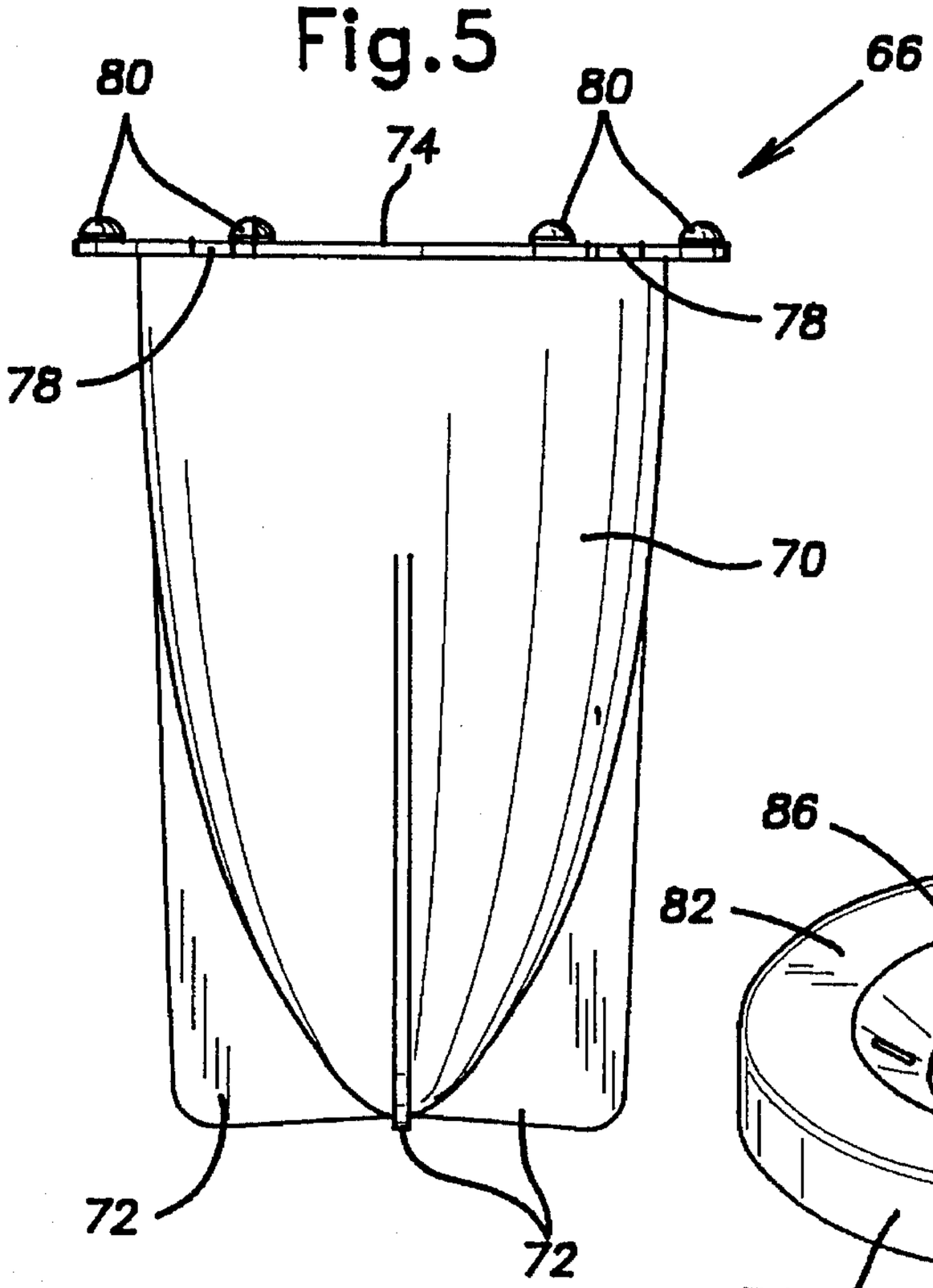
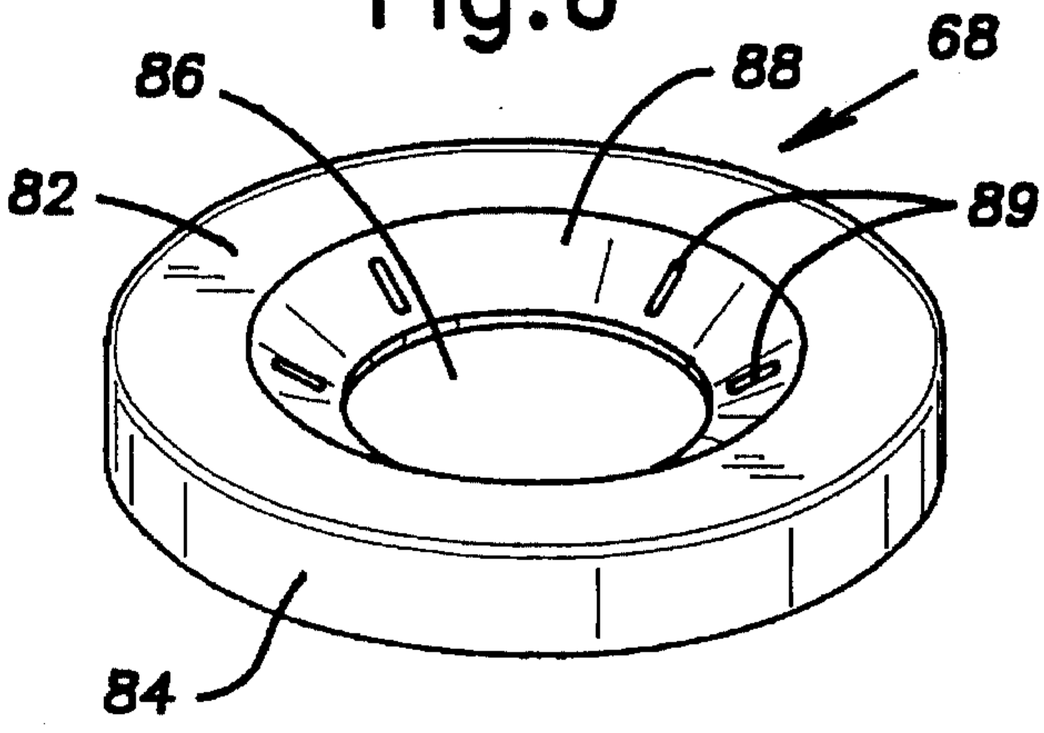


Fig.6



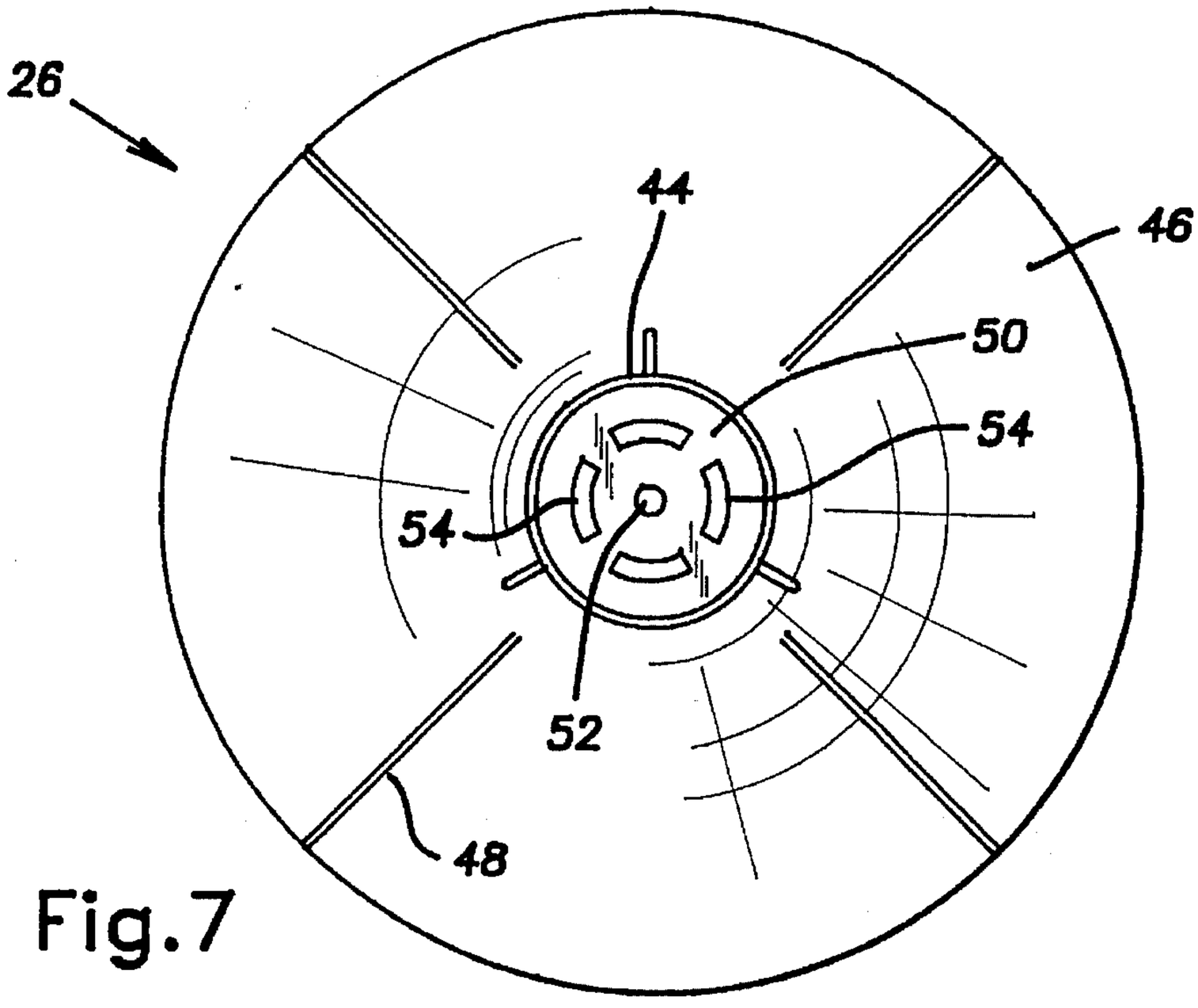
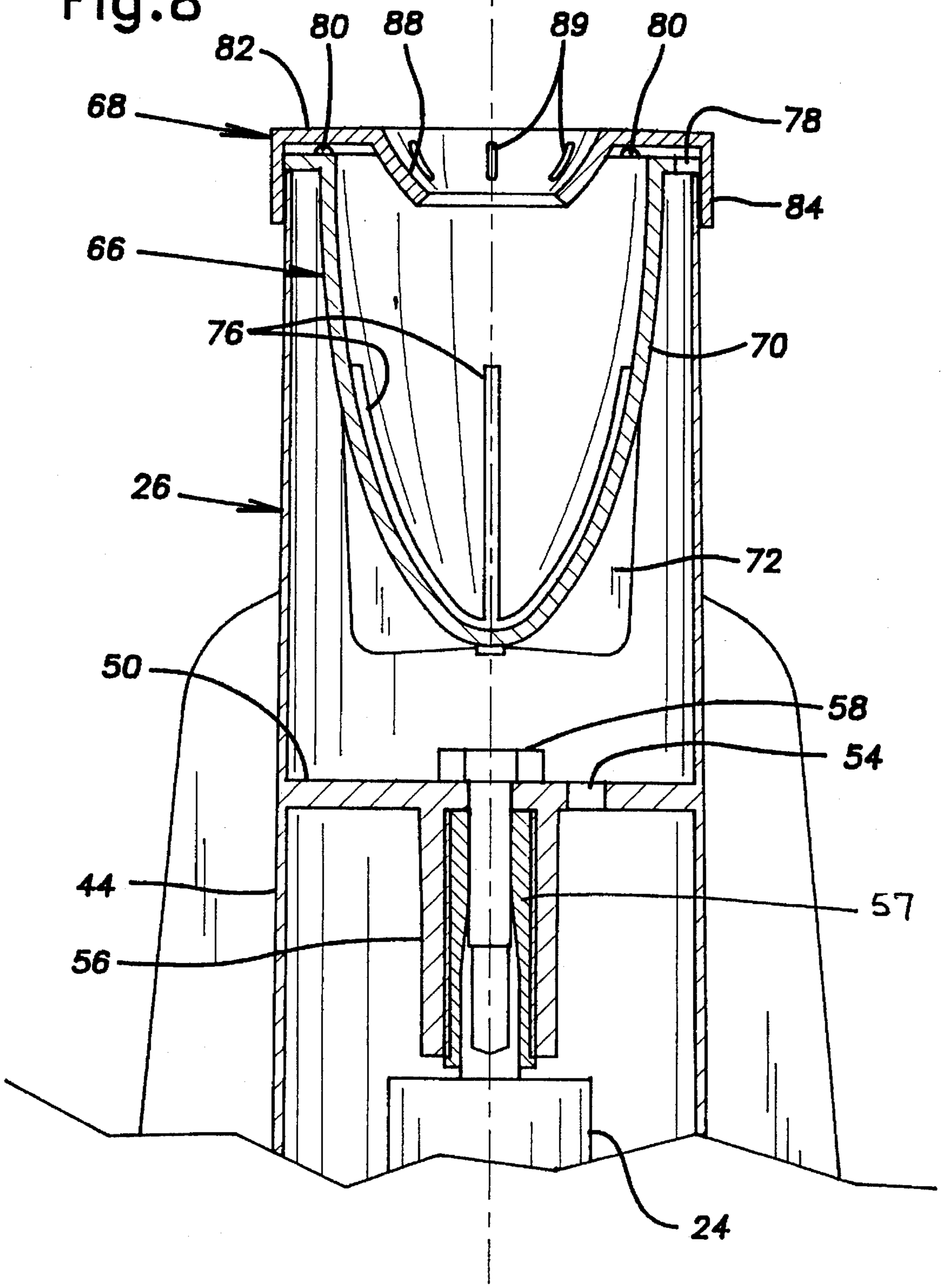


Fig.7

Fig.8



LIQUID FABRIC SOFTENER DISPENSER FOR AUTOMATIC WASHING MACHINES

BACKGROUND OF THE INVENTION

The present invention pertains to fabric softener dispensers used in domestic clothes washing machines and, more particularly, to agitator-mounted fabric softener dispensers.

Several different types of agitator-mounted fabric softener dispensers are known in the art. Typically, such dispensers are adapted to retain fabric softener or other treating liquid within a reservoir during the agitation or wash cycle of washing machine operation and to dispense the treating liquid from the reservoir to a secondary reservoir during the spin cycle. The treating liquid is finally dispensed from the secondary reservoir into the treating chamber or inner wash tub following the spin cycle.

U.S. Pat. No. 4,478,059, which issued on Oct. 23, 1984, is exemplary of such dispensers. The '059 patent discloses a bullet or egg-shaped cup from which treating liquid is dispensed during a spin cycle. Treating liquid dispensed from the cup is retained within an annular space surrounding the cup until the spin speed of the agitator slows. When the agitator rotational speed slows, the treating liquid flows down through the hollow agitator, through holes in the bottom of the inner wash tub, and into the bottom of the outer tub.

U.S. Pat. Nos. 5,044,178 and 5,113,542 disclose parabolic-shaped fabric softener dispenser cups, and methods of dispensing wherein the treating liquid is dispensed directly into the inner tub.

Expired U.S. Pat. No. 2,979,935 provides an annular flange within the hollow agitator which, in cooperation with the centrifugal forces generated during a spin cycle, retain dispensed treating liquid within the agitator until an end of the spin cycle.

U.S. Pat. No. 4,118,957 provides impeller vanes on an exterior of a dispenser cup and within a temporary storage chamber to prevent liquid dispensed from the cup from being prematurely dispensed into the inner tub. Brace members are provided at a bottom inner surface of the dispensing cup to make the cup more rigid.

The known treating liquid dispensers, as exemplified by the above-mentioned patents, suffer from the disadvantage that the treating liquid is not positively agitated or mixed during operation of the washing machine in a washing cycle, and may tend to coagulate or settle and thereafter becomes difficult to remove during a spin cycle. The known treating liquid dispensers also have a tendency to splash or spill the treating liquid into the wash tub during the wash cycle, which may damage the clothes and reduces the effectiveness of the treating liquid. Furthermore, the known treating liquid dispensers commonly dispense the treating liquid directly into the inner wash tub and onto the clothes therein, which may damage the clothes and produce inconsistent results.

SUMMARY OF THE INVENTION

The present invention is directed toward an improved treating liquid dispenser which helps eliminate the deficiencies of the currently-known dispensers. According to the present invention, the dispenser mixes the treating liquid during a wash cycle, prevents or minimizes splash out or spillage of the treating liquid during a wash cycle and, following the spin cycle, delivers the treating liquid to the outer wash tub where it mixes with rinse water and is diluted

prior to contact with the clothes in the inner wash tub.

The dispenser includes a parabolic egg or bullet-shaped dispenser cup having a body portion with a series of inwardly extending vanes along its inner surface and an annular rim portion projecting from an upper edge of the body portion. The vanes help mix the fabric softener when the washer is in an agitation mode or wash cycle, and help bring the liquid up to speed with the cup during a spin cycle. The shape of the cup is tuned to completely dispense the liquid at an appropriate spin speed. The rim portion rests upon an upper surface of the agitator and includes a series of notched openings through which fabric softener can flow into the hollow interior of the agitator. The rim portion also has a series of upwardly raised bosses formed thereon.

A cap member resiliently fits onto or over the top of the agitator and over the rim portion of the dispenser cup to retain the dispenser cup in place. An interference fit between the cap member and the agitator defines or provides a seal to prevent treating liquid from flowing down the exterior of the agitator. The bosses on the upper surface of the rim portion space the cap member from the rim portion to allow treating liquid to flow through the notched openings. The cap member provides an enlarged central opening to allow treating liquid to be directly added to the cup. The cap member and placement of the notched openings in the rim portion cooperate to minimize splash-out during agitation.

The agitator provides a partition member downwardly spaced from the dispenser cup which defines a holding chamber to temporarily retain treating liquid, which was dispensed from the dispenser cup during the spin cycle, until the rotational speed of the agitator slows at the end of the spin cycle. The partition member is integral with the interior sidewall of the agitator and provides a series of holes which are spaced radially inward from the agitator sidewall such that centrifugal forces during the spin cycle retain the treating liquid against the sidewall of the agitator and away from the holes. As the rotational speed of the agitator slows at the end of the spin cycle, the treating liquid flows through the holes in the partition member, down the agitator, through openings in an agitator bushing and the bottom wall of the perforate tub, and into the outer tub.

BRIEF DESCRIPTION OF THE DRAWINGS

These and further features of the present invention will be apparent with reference to the following description and drawings, wherein:

FIG. **1** is a perspective view of a domestic washing machine incorporating the present invention;

FIG. **2** is an elevational view, in cross section, of the washing machine shown in FIG. **1**;

FIG. **3** is a perspective view of a dispensing cup according to the present invention;

FIG. **4** is a plan view of the dispensing cup of FIG. **3**;

FIG. **5** is an elevational view of the dispensing cup of FIGS. **3** and **4**;

FIG. **6** is a perspective view of a cap member according to the present invention;

FIG. **7** is a top plan view of an agitator according to the present invention; and,

FIG. **8** is an enlarged cross sectional view of the dispenser and a portion of the agitator shown in FIG. **2**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention provides an improved fabric softener or treating liquid dispenser for a domestic clothes

washing machine **10**, illustrated in FIGS. **1** and **2**. The clothes washing machine **10** includes a cabinet **12** having an upper surface **14** to which a door **16** is pivotally mounted to permit access into the interior of the machine **10**. A control console **18** is provided at a rear of the upper surface, as illustrated, and includes control knobs and switches to allow a user to select a desired operating cycle or sequence of cycles for the machine **10**.

With reference to FIG. **2**, the washing machine **10** includes an inner, perforated wash tub **20** which is surrounded by an outer, imperforate tub **22**. A drive shaft **24** extends through the inner and outer tubs **20**, **22** and has an agitator **26** mounted thereover. A transmission **28** and motor **30** are provided beneath the outer tub **22** and are operably connected to the drive shaft **24** to rotate the drive shaft **24** in accordance with a user-selected operational sequence.

A bottom wall **32** of the inner tub **20** underlying the agitator **26** has a series of holes **34** formed therein. A mesh ring **36**, which may be integrally formed with the inner tub **20** or attached thereto by conventional means, covers the holes **34** in the bottom wall **32** of the inner tub **20** and filters lint or other suspended particles from the wash water.

A bearing member **38** is secured to the bottom wall **32** of the inner tub **20** and rotatably engages the drive shaft **24**. The bearing member **38** aligns the inner tub **20** with the drive shaft **24**. A seal member **40** is provided between the outer tub **22** and the drive shaft **24** to prevent wash liquid within the outer tub **22** from flowing or leaking down the drive shaft **24**. A water inlet (not shown) is provided to introduce wash water into the inner tub **20**, and a drain hole **42** is formed in a sump portion of the outer tub **22**. The drain hole **42** is connected, via a hose (not shown) and associated drain pump, to household drain.

The agitator **26** has a generally elongated, cylindrical shaft **44** which is mounted over the drive shaft **24**. A lower portion **46** of the agitator **26** is radially flared, and the agitator **26** has a series of upstanding vanes **48** formed thereon which engage and mix the clothes and wash water contained within the inner tub **20**. It is submitted that the foregoing generally describes a rather well-known or conventional washing machine assembly, and is provided herein only to clarify the environment in which the present invention, to be described hereafter, is employed.

The agitator **26** also provides a partition member **50** which spans the interior of the cylindrical agitator shaft **44**. The partition member **50** is preferably integrally formed with the agitator shaft **44** and has an axially-aligned bore **52** and a series of openings **54** formed therein. As shown best in FIG. **7**, the openings **54** are located between the axial bore **52** and the cylindrical agitator shaft **44**, i.e., radially inwardly spaced from the agitator shaft **44** and radially outwardly spaced from the axial bore **52**.

A cylindrical sleeve **56** (FIG. **1**), which is co-axial with the agitator shaft **44**, projects downwardly from the partition member **50** and receives a top end of the drive shaft **24**. A series of stiffening ribs (not shown) extend between the sleeve **56** and the agitator shaft **44** to prevent the sleeve **56** from moving laterally relative to the agitator **26**. Preferably, an insert **57** is placed over the top of the drive shaft **24** and forms a spline-type connection with the sleeve **56** to force the agitator **26** to rotate with the drive shaft **24**. A threaded bolt **58** extends through the axial bore **52** in the partition member **50**, through an opening in the insert **57**, and into a threaded hole in the top end of the drive shaft **24** to secure the agitator **26** to the drive shaft **24** and prevent relative axial or longitudinal movement between the drive shaft **24** and the agitator **26**.

Downwardly spaced from the partition member **50**, a bushing **60** is secured to the interior surface of the agitator shaft **44**. The bushing **60** engages the drive shaft **24** and cooperates with the sleeve **56** to maintain the agitator **26** and the drive shaft **24** in an aligned or co-axial condition. The bushing **60** has a series of holes **62** formed therein to allow fluid to flow therepast.

An improved treating liquid dispenser **64** is mounted to a top of the agitator shaft **44**. The dispenser **64** includes a dispenser cup **66** and a cap member **64**. With reference to FIGS. **3–5**, the dispenser cup **66** has a parabolic egg or bullet-shaped body portion **70** from which a series of legs **72** downwardly extend and an annular rim portion **74** radially projects. The legs **72** provide a support which allows the dispenser cup **66** to stand up in a self-supporting fashion if it is removed from the washing machine **10** for filling or cleaning. The cup body portion **70** also has a series of vanes **74** formed on an inner surface thereof which help to mix and dispense treating liquid, as will be described more fully hereafter.

The dispenser cup body portion **70** is shaped or tuned to completely dispense treating liquid therefrom at an appropriate rotational or spin speed. Preferably, the cup body portion **70** is shaped according to the equation $\alpha=90-\tan^{-1}(0.2868/r)$, wherein α is the angle from horizontal in degrees and r is the distance, in inches, of the body portion **70** from the body portion centerline.

As shown best in FIGS. **3–5**, the rim portion **74** projects radially outwardly from an upper edge of the cup body portion **70**, and has a series of notched openings **78** formed therein. An upper surface of the rim portion **74** has a plurality of bosses **80** formed thereon which project projecting upwardly therefrom.

With reference to FIG. **6**, the cap member **68** provides a generally circular, main body portion **82** from which an annular wall **84** downwardly extends. A central opening **86** is formed in the main body portion **82**, and a downwardly sloped, funnel-like surface **88** surrounds the central opening. The surface **88** preferably has a series of slotted openings **89** formed therein which allow air to escape from the cup **66** during filling thereof. The cap member **68** is preferably formed from a flexible plastic, such as low density polyethylene.

The dispensing cup **66** is mounted on the agitator **26** by inserting the cup body portion **70** through the circular opening in the top of the agitator shaft **44** and into the hollow interior of the agitator until the lower surface of the rim portion **74** abuts or rests upon an annular top surface of the agitator shaft **44**. The rim portion **74** preferably has a diameter which is generally equal to the diameter of the annular top surface of the agitator shaft **44**.

Thereafter, the cap member **68** is pushed or pressed down over the rim portion **74** and the top of the agitator shaft **44**. The downwardly projecting annular wall **84** of the cap member **68** has an inner diameter generally equal to, or slightly less than, the outer diameter of the rim portion **74** and the agitator shaft's annular top surface and forms an interference-type fit with the agitator shaft **44** and the rim portion **74**. When the cap member **68** is pressed over the top of the agitator it serves to center the rim portion **74** of the dispenser cup **66** on the top surface of the agitator. As such, the dispenser cup is aligned with the axis of rotation of the agitator **26** and drive shaft **24**.

The bosses **80** on the upper surface of the rim portion **74** serve as a stop to limit downward movement of the cap member **68**, and space the cap member **68** from the upper

surface of the rim portion **74**, thereby defining a flow passage between the rim portion **74** and the cap member **68** through which treating liquid may flow from the interior of the cup **66** toward the notched openings **78**, as will be discussed more fully hereafter. The interference fit seals the cap member **68** to the agitator **26** and prevents treating liquid from flowing down the exterior of the agitator **26**.

Operation of the washing machine **10** and the treating liquid dispenser **64** is as follows. The washing machine **10** is filled with water and detergent and operated in a wash cycle wherein the agitator is rotated back-and-forth in an oscillating or alternating fashion by the motor **30** via the transmission **28**. Treating liquid within the dispensing cup **66** is agitated or mixed by the vanes **76** on the inner surface of the cup body portion **70** and, therefore, does not settle, agglomerate, or stick to the interior of the cup. The cap member **68** prevents or minimizes splash out of treating liquid during the wash cycle.

At the end of the wash cycle, the washing machine **10** is drained of wash water, and the machine is operated in a spin cycle wherein the agitator **26** and inner tub **20** are rotated in one direction at a high rate of speed by the motor **30** via the transmission **28** to centrifugally extract water from the clothes.

During the spin cycle, the treating liquid within the dispensing cup body portion **70** is caused to rotate with the agitator **26** due, in part, to the vanes **76** provided on the inner surface of the cup **66**. Centrifugal forces cause the treating liquid to rise or flow up along the inner surface of the cup body portion **70**, into the flow passage between the cap member **68** and the upper surface of the rim portion **74**, and through the notched openings **78** in the rim portion **74**. The seal between the cap member **68** and the agitator prevents the treating liquid from flowing down the exterior surface of the agitator **26**.

The treating liquid flows downwardly inside the hollow interior of the agitator shaft **44** until it reaches the partition member **50**. Centrifugal forces created by high speed rotation of the agitator **26** retain the treating liquid against the inner surface of the agitator shaft **44** adjacent the partition member **50**, but spaced radially outward of the openings **54** formed therein.

As the rotational speed of the agitator **26** slows at an end of the spin cycle, the centrifugal forces on the treating liquid decrease. This allows the treating liquid to flow, due to gravity, through the openings **54** in the partition member **50**, down the hollow interior of the agitator shaft **44**, and through the openings **62** in the bushing **60**. At this point, the treating liquid is beneath the flared portion **46** of the agitator and flows through the holes **34** and mesh ring **36** in the bottom wall **32** of the inner tub **20** and into the outer tub **22**.

Following the spin cycle, the machine **10** is operated in a rinse cycle wherein fresh water is added to the outer tub **22** and the agitator **26** is rotated back-and-forth in an oscillating or alternating fashion. The fresh water added to the machine **10** mixes with and dilutes the treating liquid, and thereby creates a clothes treating mixture or solution which will treat the clothes within the inner tub **20** without damaging the clothes. Following the rinse cycle, the solution is drained from the machine **10** and, preferably, a second spin cycle extracts remaining water from the clothes.

As noted hereinbefore, some of the prior art methods dispense treating liquid directly into the inner tub **20**, and onto the clothes therein, following the first spin cycle. Undiluted treating liquid may damage or stain the clothes it comes into contact with, thereby lessening the desirability of using the prior art treating liquid dispensers. As should be apparent from the foregoing description, the present invention overcomes the shortcomings of the aforementioned prior art dispensing methods, and prevents undiluted treating liquid from contacting the clothes within the inner tub **20**.

While the preferred embodiment of the present invention has been described in the foregoing, it is clear that various rearrangements, modifications, and substitutions of parts could be employed without departing from the scope and spirit of the present invention as defined by the claims appended hereto. For example, it may prove more economical or practical to form the bosses **80** on a lower surface of the cap member main body portion **82** than on the upper surface of the cup rim portion **74**. Furthermore, ribs could be formed on the external surface of the cup body portion **70** which would serve to center or align the dispenser cup **66** with the rotational axis of the agitator **26**. Also, the notched openings **78** in the rim portion **74** could be of various shapes or sizes, and are not limited to the preferred shape, size, and distribution illustrated herein.

What is claimed is:

1. A treating liquid dispenser, comprising:

a dispenser cup having a body portion and a radially extending rim portion, said rim portion having a series of openings formed therein and an upper surface from which a plurality of bosses project; and,

a cap member overlying said dispenser cup, said cap member having a main body portion and a downwardly projecting annular wall, said main body portion having an opening formed therein to permit the introduction of treating liquid into said dispenser cup, wherein an inner surface of said main body portion is spaced from said rim portion by said bosses and thereby allows treating liquid within said cup body portion to be dispensed therefrom through the openings in the rim portion.

2. A treating liquid dispenser according to claim **1**, further comprising an agitator, a top portion of said agitator providing an annular surface, wherein a lower surface of said rim portion rests upon said annular surface and said downwardly projecting annular wall surrounds an outer surface of said agitator adjacent said annular surface.

3. A treating liquid dispenser according to claim **2**, wherein said agitator includes a partition member and defines a holding chamber for the temporary receipt of treating liquid dispensed from said cup, said partition member having a series of openings formed therein, said openings being spaced radially inwardly from an inner surface of said agitator.

4. A treating liquid dispenser according to claim **3**, wherein said agitator is mounted upon a drive shaft and has a bushing at a lower end of thereof, said bushing having a series of openings formed therein to allow treating liquid dispensed from said holding chamber to flow past said bushing toward clothes to be treated.

5. A treating liquid dispenser according to claim **1**, wherein an inner surface of said body portion has a plurality of vanes formed thereon, said body portion being adapted to receive treating liquid.

6. A treating liquid dispenser according to claim **5**, further comprising an agitator, a top portion of said agitator providing an annular surface, wherein a lower surface of said rim portion rests upon said annular surface and said downwardly projecting annular wall surrounds an outer surface of said agitator adjacent said annular surface.

7. A treating liquid dispenser according to claim **6**, wherein said agitator includes a partition member and defines a holding chamber for the temporary receipt of

treating liquid dispensed from said cup, said partition member having a series of openings formed therein, said openings being spaced radially inwardly from an inner surface of said agitator.

8. A treating liquid dispenser according to claim **7**, wherein said agitator is mounted upon a drive shaft and has a bushing at a lower end of thereof, said bushing having a series of openings formed therein to allow treating liquid dispensed from said holding chamber to flow past said bushing toward clothes to be treated.

9. A treating liquid dispenser according to claim **5**, wherein said main body portion of said cap member has a funnel-like surface surrounding said opening, said funnel-like surface having a series of openings formed therein.

10. A treating liquid dispenser according to claim **1**, wherein said main body portion of said cap member has a funnel-like surface surrounding said opening, said funnel-like surface having a series of openings formed therein.

11. A washing machine, comprising an outer wash tub, an inner wash tub, means for operating said washing machine through a series of sequential cycles of operation, an agitator, and a treating liquid dispenser mounted to said agitator, said dispenser comprising a dispenser cup and a cap member, said dispenser cup having a body portion and a radially extending rim portion, said rim portion having a series of openings formed therein and an upper surface from which a plurality of bosses project, said cap member overlying said dispenser cup and having a main body portion and a downwardly projecting annular wall, said main body portion having a central opening formed therein to permit the introduction of treating liquid into said dispenser cup, wherein an inner surface of said main body portion is spaced from said rim portion by said bosses and thereby allows treating liquid within said cup body portion to be dispensed therefrom through the openings in the rim portion.

12. A washing machine according to claim **11**, wherein a top portion of said agitator has an annular surface, a lower surface of said rim portion rests upon said annular surface and said downwardly projecting annular wall surrounds an outer surface of said agitator adjacent said annular surface.

13. A washing machine according to claim **12**, wherein said agitator includes a partition member and defines a holding chamber for the temporary receipt of treating liquid dispensed from said cup, said partition member having a series of openings formed therein, said openings being spaced radially inwardly from an inner surface of said agitator.

14. A washing machine according to claim **13**, wherein said agitator is mounted upon a drive shaft and has a bushing at a lower end of thereof, said bushing having a series of openings formed therein to allow treating liquid dispensed from said holding chamber to flow past said bushing toward clothes to be treated.

15. A treating liquid dispenser according to claim **11**, wherein said main body portion of said cap member has a funnel-like surface surrounding said central opening, said funnel-like surface having a series of slotted openings formed therein.

16. A method for dispensing treating liquid into a washing machine, said washing machine having an agitator, a dispensing cup, and a cap member, said dispensing cup being supported upon an upper surface of said agitator and providing a body portion and a rim portion which radially extends from said body portion, said body portion being adapted to receive treating liquid and having an inner surface including a series of inwardly extending vanes, said rim portion having an upper surface from which projects a series of bosses and having a series of openings formed therein, said cap member overlying said dispensing cup and being resiliently pressed over an upper end of said agitator, a lower surface of said cap member being maintained a distance from said rim portion upper surface by said bosses, comprising the steps of:

operating said washing machine in a wash cycle whereby said agitator rotates back and forth in an alternating fashion;

mixing said treating liquid within said body portion of said dispensing cup during said wash cycle;

operating said washing machine in a spin cycle whereby said agitator rotates in one direction at a high rate of speed, centrifugal forces generated during said wash cycle causing said treating liquid to flow up the inner surface of said cup body portion and downwardly through said openings in said rim portion and into the hollow interior of said agitator;

retaining the treating liquid within a holding chamber formed within the agitator;

dispensing the treating liquid from the holding chamber when the rotational speed of the agitator slows to a predetermined rate at an end of the spin cycle;

directing the treating liquid down the interior of the agitator and into the outer wash tub wherein the treating liquid is mixed with wash water and subsequently distributed throughout the inner wash tub and the clothes therein.

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